

## Periscope.

### a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

CEREBRAL LOCALIZATIONS.—In a short note reprinted from the *St. Bartholomew Hospital Reports*, vol. XIII., Dr. Ainslie Hollis maintains that in the present state of our knowledge, we have only the assurance that there exist in the brain a posterior, a retentive system, and an anterior or expressive system. The expressive system may be said, generally, to consist of the fronto-parietal convolutions. Of these the parietal convolutions, immediately bounding the great fissure of Rolando, are concerned in the movements of limbs, neck, back, etc.,—that is to say, the acquired movements of these parts; for Soltmann and others have found that in the very young, before experience has been acquired, the movements described by Hitzig, etc., as depending on electrization of these convolutions and no others are not in the same way present. The adjoining frontal convolutions are concerned in the complex symbolic actions of speaking, numbering, writing, etc., as has partly been made out by direct pathological evidence, and partly may be inferred from the greater frontal development in cultured races as compared with savages, whose sense-acuteness is not accompanied by the intelligence which involves a highly developed system of symbolic expressions. What Dr. Ainslie Hollis calls the *retentive* (better, perhaps, the receptive) system consists, he believes, of the posterior or occipito-temporal lobes. He adduces two cases in support of this position. One of these was noted by Dr. Bateman in his essay on Aphasia—that of a gentleman who put vinegar on his food instead of pepper, and said “How bright the poker looks,” but adding, when told he meant the fire, “Yes, I mean the fire.” Dr. Bateman called this (with some hesitation) a case of amnesic aphasia, supposing that “the idea was conceived, but the means of communication with the external world did not exist.” But as the autopsy showed that the frontal lobes were perfectly healthy, and only the posterior third of the left hemisphere was diseased, it is rather, Dr. Ainslie Hollis urges, to be supposed that, while the power of expression was intact, there was a loss of power of appreciating or recognizing the attributes of objects. His other case is that of a letter sorter,

who became unable to do his work; first losing, as he declared, the clear mental picture of the position and relations of the openings in his nest of pigeon-holes. Here the disease proved to be tumor in the left temporal lobe. In conclusion, the author utters a warning against the attempt to localize in the cortex too closely the several faculties of the mind. It is preposterous to expect that similar cells are reserved for similar functions in all human brains, knowing what we do of the great diversity in man's mental nature, his various occupations, proclivities and talents. *Mind*, Apr., 1877.

The following are the general conclusions at the close of a very elaborate article by MM. Charcot and Pitres, running through several numbers of the *Revue Mensuelle de Médecine et de Chirurgie* and concluded in the June issue:

1. The cortex of the human brain is not functionally homogeneous; only one part of the convolutions is devoted to the regular exercise of the voluntary movements. This part, which we may designate as the cortical motor zone, comprehends the paracentral lobule, the ascending frontal convolution, the ascending parietal convolution, and perhaps also the foot of the frontal convolutions.

2. All cortical lesions, of whatever extent, lying outside of this motor cortical zone, are latent as regards troubles of motility; that is, they cause neither paralysis nor convulsions. We may add that they are never accompanied by secondary degenerations of the spinal cord.

3. On the other hand, destructive lesions, even when very limited, attacking, either directly or indirectly, the motor zone, necessarily provoke troubles of voluntary motility.

4. If the lesion is *brusque*, if it destroys at once a large part of the cortical motor zone, it gives rise to a sudden hemiplegia, accompanied later by a secondary degeneration of the spinal cord, and later, developing contracture of the paralyzed muscles, resembling altogether the common form of central hemiplegia.

5. If the lesion is limited to a restricted tract of the cortical motor zone, it gives rise to monoplegias (suppression of functions) and to convulsions, generally of the form we have studied under the name of partial epilepsy (phenomena of irritation). After a certain period these very limited destructive lesions of the motor zone cause a secondary degeneration, which descends through the cerebral peduncle and the medulla oblongata into the lateral column of the opposite side of the cord.

6. The study of the paralyzes and the convulsions of cortical origin demonstrates that the cortical motor centres for the two members of the opposite side are situated in the paracentral lobule, and in the two upper thirds of the ascending convolutions, and that the centres for the movements of the lower part of the face are located in the lower third of these convolutions, near the fissure of Sylvius.

7. It is very probable that the centre for the isolated movements of the upper member are situated in the middle third of the ascending frontal convolution of the opposite side.

8. Finally, we do not know yet exactly the situation of the cortical

motor centres for the movements of the nape, the neck, the eyes, or the eyelids.

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**THE VASO-MOTOR NERVE-ROOTS IN THE SCIATIC.**—The following is the abstract of a memoir by Stricker on the vaso-motor roots in the sciatic. (*Sitzungber. der Akad. d. Wiss.* Wien, July, 1876) and some criticisms on the same, and reinvestigations of the same subject by A. Cossy, (*Arch. de Phys.*, 832, 1876) as given in the *Revue des Sciences Médicales*, Apr., 1877.

The author divides his memoir into three chapters.

In the first, he studies the origin of the vaso-dilator fibres of the sciatic nerve. These fibres are direct and indirect; the direct are contained in the posterior roots of the fourth and fifth lumbar pairs; the mechanical or electrical excitation of the peripheral ends of these roots causes an elevation of temperature in the corresponding members. The indirect fibres follow the track of the superior lumbar and the thoracic nerves. Their origin may be demonstrated as far as to the fourth thoracic pair.

In the second chapter, he explains the method followed in his experimentation.

Finally the third chapter contains the account of two experiments, of which we give the conclusions.

The first was on a young dog, whose spinal cord was divided about the fourth dorsal vertebra. Repeated sections of the sensory root of the right sciatic nerve (right sensory root of the last lumbar pair) caused in the corresponding limb a rise in temperature of  $10^{\circ}$  (from  $22^{\circ} 2$  to  $32^{\circ} 5C$ ); its excitation only caused a rise of  $4^{\circ} 4$ . Excitation of the motor root caused first a reduction, then an elevation of temperature.

In the same animal, excitation of the peripheral end of the left sciatic, recently divided, caused an elevation of temperature of between  $2^{\circ}$  and  $10^{\circ}$ .

Finally separation of the lumbar from the dorsal cord, caused an elevation of temperature of the posterior members lasting from two to many days.

The second experiment was also on a dog, whose cord was cut between the fifth and sixth dorsal vertebra. The section or ligature of the sensory root of one lumbar pair caused a rise of temperature of from  $1^{\circ}$  to  $3^{\circ}$ .

Section or excitation of the corresponding motor root gave no results.

Altogether, there was a constant elevation of temperature after section or excitation of the motor roots in eight animals experimented upon. On the contrary, the same operations performed upon the motor roots produced only a very slight elevation of temperature or none at all.

In this memoir we have therefore this new evidence of the presence of vaso-dilator fibres in the posterior roots of the fourth and fifth lumbar nerves, in opposition to the usual opinion, according to which the vaso-motor fibres leave the cord by the anterior roots.

This conclusion seemed premature to M. Cossy, who made, under M. Vulpian's direction, two experiments to test its truth. The results he obtained are analogous rather than similar to those of Stricker. In fact, the

rise of temperature consecutive to the section, and especially to the excitation of the posterior roots of these last lumbar pairs, is not produced in any constant fashion. Further, the section of the anterior roots left their temperature stationary, and their excitation constantly increased it. But experiments carried out so minutely are free from many causes of error that Stricker could not avoid. Such are, first, the muscular contractions which in non-curarized animals, may contribute to increase the temperature; in the next place, it is difficult to take this temperature, and then we have still the procedure adopted for the division of the cord, difficult in its application and often uncertain of success.

Finally, the modifications of temperature observed by Stricker differ much from those produced by electrization of the vaso-dilator nerves that have been well studied up to the present date, the chorda tympani, for example. We are not yet in a position, therefore, to consider the existence of vaso-motor nerves in the posterior roots of the lumbar nerves, as established.

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NEW RESEARCHES ON THE LIVER.—Dr. B. F. Lautenbach, in an interesting paper in the *Philadelphia Med. Times*, of May 26, publishes the results of some very important experiments on the functions of the liver, part of which were made in connection with Prof. Schiff at Florence, and part independently.

He found that ligation of the portal vein in mammals produced the following symptoms, which we state in the author's own words:

"A great tendency to sleep, owing to the abolition of both tactile and general sensibility.

"A diminished frequency in the beat of the heart, and an increased, followed by a decreased arterial pressure.

"Paresis of the heart—arresting fibres of the pneumogastrics, so that irritation of the sympathico-vagi trunks will no longer cause cessation of the heart's movements. In this connection it must be stated that, following the ligature, contractions of the diaphragm occur isochronous with the beat of the heart, and disappear when the left phrenicus is lifted off the pericardium, to occur again when this is again brought in contact with the heart. I have frequently observed this symptom in animals that have been poisoned with drugs which produce paralysis of the heart arrestors; and I have shown (*Phil. Med. Times*, Mar. 31, 1877,) that this phenomena is due to an electrical current which is developed in the muscles of the heart and conducted by the left phrenic nerve (the right not being in contact with the pericardium, its presence or removal has no effect on the contractions) to the diaphragm.

"A great diminution in the number of the respiratory movements, which frequently become stertorous.

"Shortly before death a most curious symptom can frequently be observed. The animal has ceased to respire for several minutes, there is no heart beat to be felt, and to all purposes the animal is dead; if, however, you now draw on the trunk of the carotid slightly downward, the animal

frequently commences again to breathe, and the heart-beat again becomes manifest, to cease again after several minutes. Should artificial respiration be resorted to, the beat of the heart would continue for an indefinite period of time."

In cold-blooded animals these phenomena were lacking after extirpation of the liver, but appeared in some cases in which he experimented by tying the hepatic vena cava in the frog.

In seeking the cause of these symptoms, the author excludes portal congestion because ligation of the hepatic veins produced no such symptoms, anæmia, since the convulsions that would accompany death from that condition were wanting, accumulation of biliary matters, since the ligation of the bile ducts produced no such phenomena. Nor can the symptoms be due to the formation of septic poison in the liver through decomposition, as the time is hardly sufficient, the poison could not be detected by inoculation of other animals, and in experiments in which this factor was carefully eliminated by supplying the liver with blood amply enough to prevent decomposition, the results were the same.

These hypotheses being disposed of, Dr. Lautenbach next offers what seems to him the true explanation. Noticing that certain animals secrete normally, and others pathologically, virulent poisons, he asks is it not possible that all animals produce in their systems poisons, which, if not excreted or destroyed internally, would rapidly prove fatal to their generators. Then following he seeks to prove that the symptoms observed after the tying of the portal vein are due to the accumulation in the system of a poison, that under normal conditions is destroyed by the liver. Reasoning from this he concluded that in the blood of an animal whose portal vein was tied, there would be found poison which could be detected by its action on lower animals, such as frogs, especially on such as had had their liver extirpated. The experiments performed to test this question proved the fact, the frogs dying with same symptoms as the higher animals after the operation of tying the portal vein. Control experiments with the blood of the same animal before the ligation and with that from animals whose vena cava had been tied, or in which a sling only had been placed around the vena porta, produced absolutely no effect on frogs. The author therefore concludes that the blood of an animal whose portal vein has been tied contains a virulent poison which does not exist normally, but accumulates directly upon the operation. The final proof of this poison, its separation, was impracticable, all attempts to isolate it failed, owing to its great volatility or destructibility.

Dr. Lautenbach next attempted to find what other poisons had their action destroyed or modified by the liver. Having noticed that it was almost impossible to kill an animal with nicotine administered by the mouth, he first tested this agent, by so injecting it into the veins that it would first have to pass through the liver before entering the general circulation, after having first determined the lethal amount when directly introduced into the blood without this precaution, and also the amount sufficient to produce death rapidly in animals after ligation of the portal vein. The results of these experiments seemed to show very plainly that the

poison was very materially modified and even destroyed by the liver. To see whether the contact with the liver substance destroyed the poison, he macerated a quantity of nicotine with the livers of freshly-killed animals, and then injected the expressed juices into dogs and liverless frogs, with the effect of producing some of the symptoms of nicotine poisoning, which, however, soon passed off and the animals recovered. Then, after ascertaining that the expressed juice of the kidney is not poisonous, he macerated fresh kidney tissue with quite a small quantity of nicotine, and succeeded in killing the animals into which it was injected.

From the results of all his experiments with this agent, Dr. Lautenbach felt justified in believing that nicotine contains two poisons, one of which, producing the non-fatal ataxic symptoms, is not affected by the liver, while the other, causing the fatal tetanic symptoms, is completely destroyed by it.

Similar experiments were made upon other poisons to find which of them were also neutralized through the action of the liver. Such were found to be hyoscyamia and conia, and the venom of the cobra snake, which was obtained for experimentation from Dr. S. Weir Mitchell. On the other hand, atropia, curare, and hydrocyanic acid were found not to have their action modified by this organ. This point of difference between atropia and hyoscyamia is of interest, as they are much alike in some other respects.

From the whole of his experiments the author is led to the following conclusions:

1. The liver has for one of its functions the office of destroying certain of the organic poisons.

2. A poison is being constantly formed in the system of every animal which it is the office of the liver to destroy.

The suggestiveness and importance of these investigations will be evident to every one, and it is to be hoped that they may be still further followed up. They suggest new explanations of many hitherto obscure phenomena, and if the results are verified by future observers, will entitle the author to a rather high rank among physiological discoverers.

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EFFECTS ON THE CIRCULATION OF EXCITATION OF THE SPECIAL SENSES.  
—At the session of the Soc. de Biologie, Apr. 28, (rep. in *Gaz. des Hôpitaux*) M. Couty offered in his own name and that of M. Charpentier, the following communication:

Operating on curarized dogs, and using the kymograph, and more rarely the cardiograph also, they excited the ear by various noises, cries of some other animal, metallic sounds, whistling, etc.; the eye by diffuse light, the light of a lamp, the sight of another animal, mechanical irritation of the retina, etc.; the taste by aloes, colocynth, salt, etc.; the nose by sulphohydric acid, various essences, etc. All these methods produced vasculo-cardiac disturbance varying with the irritation, and for the same irritation varying with the animal, and for the same animal varying with the

moment of the experiment. The heart was sometimes slowed, sometimes quickened; the vascular tension sometimes augmented, sometimes slightly reduced; and in the case of the purely emotional excitation caused by the cries of another animal these troubles were comparable as regards intensity, if not as regards their nature, to those produced by energetic excitation of the sciatic.

The author stated that they would endeavor in a future communication to determine the mechanism of these disorders and their relations with those caused by excitations of other sensory organs.

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**THE PHYSIOLOGY OF SLEEP.**—The following are the conclusions of a communication by M. Villemain, read before the Acad. de Medicine, Paris, April 3d, and as reported in the *Bull. Gén. de Thérapeutique*, Apr. 30.

Physiological sleep is a law of cerebral nervous activity, the law of functional periodicity.

This law has its *raison d'être* in the necessity for repair of the organic elements, which are incessantly used by the functional activity, and the sufficient repair of which cannot be accomplished during the continuity of action of the organ.

The physical conditions in which the encephalic cells are after a period of activity, modify the vaso-motor innervation; the cerebral cells contract; the afflux of blood is diminished, the functional activity of the brain is suspended, sleep ensues and the repair of the nervous elements begins.

For the awakening, the incitation carried to the brain any one of the sensory nerves, or the mere fact that repair has been accomplished, causes the nerve cells to retake their functions; this involves a vascular dilatation, and the functional activity of the brain recommences.

In the sleep produced by anæsthetics, the defect of excitability of the brain is the cause of the phenomenon; it is not due to fatigue of the cells, but results from a special physico-chemical action of the toxic agent on the elements; by a reflex action the vessels contract themselves and enough blood does not reach the brain to call it into action.

Magnetic sleep does not depend upon any physico-chemical action of the encephalic cell, but is due to a reflex action exercising itself from the eye on the nervous vaso-motor centres. The vaso-motor spasm may be general, and then complete hypnotism appears, either with or without cataleptic accidents, (complete abolition of the sensibility when the sensitive centres are deprived of blood, circumscribed paralysis when the ischemia is partial).

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**ELECTRIC CURRENTS OF THE BRAIN.**—Dr. Richard Caton, of Liverpool, England, publishes in the *British Medical Journal*, May 5, an "Interim report on the investigation of the electric currents of the brain." As this is a summary of the results of his investigations, we reproduce it here, as follows:

This research has consisted in the examination of the electric currents of the brains of upwards of forty rabbits, cats and monkeys; the rabbit having been principally employed. The instruments used have been Sir William Thomson's reflecting galvanometer, etc., with Du Bois Reymond's non-polarizable electrodes. Small, light electrodes, supported by small screw clamps, fixed firmly to the skull, in such a manner that no movement of the animal's body could affect the position of the electrodes on the brain.

The results hitherto obtained may be summed up as follows:

*I. Facts observed relating to the electric currents themselves.*

*a.* All the brains examined have shown evidence of the existence of electric currents.

*b.* If one electrode be applied to the external surface of the brain, and the other to the vertical section, a strong current passes through the multiplier, the external surface being usually positive to the vertical section.

*c.* If both electrodes be applied to the external surface, or one to the external surface and one to the surface of the skull, a feebler current passes through the multiplier.

*d.* The strength or the current varies at different points.

*e.* The current is usually in constant fluctuation; the oscillation of the index being generally small, about twenty to fifty degrees of the scale. At other times great fluctuations are observed, which in some instances coincide with some muscular movements or change in the animal's mental condition.

*II. Observations on the relations of the electric currents to the function of the brain.*

*a.* I was led to suppose it probable that some such relation existed, from the fact that fluctuations of the electric current often occurred coincidentally with some movement of the animal's body, or change in its mental condition; *e. g.*, a variation of the current frequently occurred when the rabbit awoke from sleep, or when anæsthesia was produced, or when death was occurring. The current usually fell to near zero after death.

*b.* An examination was made of the currents of special areas. For example, the area pointed out by Professor Ferrier as related to rotation of the head, was studied in six rabbits, with a view to discover if any change in the current occurred when the animal turned the head. In two rabbits out of the six, variation of the current was observed whenever the head was turned toward the opposite side.

*c.* The masticatory area was next experimented upon in eleven rabbits and two monkeys; and in four of the former, and one of the latter, marked variation was seen whenever the animal masticated. The remaining experiments were without result, either because the animals refused to eat, or from other causes to be spoken of below.

*d.* In two rabbits, a point was discovered close to the masticatory area, the current of which always showed variation when food was presented to the animal, but before mastication commenced. This area was thought to be probably related to the perception of the odor of food.

*e.* A number of experiments were made, to ascertain if the electric cur-



rents of any part of the hemisphere were related to common sensation in the skin. The skin was stimulated in different parts of the body by means of a gentle interrupted current. Nothing resulted, excepting that some evidence was obtained indicating that the currents in and about the masticatory area were influenced by stimulation of the lips and cheeks. Gentle pinching of the lips and cheeks was also seen to be invariably followed by fall in the current of the same part of the brain. This was observed in six rabbits.

*f.* Search was made to discover an area related to perceptions of sound. The electrodes were placed on various parts of the brain, and loud sounds were made close to the rabbit's ears by means of a bell, etc. No results were obtained.

*g.* A similar search was made to discover an area related to impressions on the retina. A point was found on the posterior and lateral part of the hemisphere in which, in three rabbits out of seven experimented on, variation of the current was seen to occur whenever a bright light was thrown upon the retina.

The fact of so large a proportion of the experiments (more than half) being failures may be accounted for by the great difficulty encountered. Swelling and congestion of the exposed brain occurs sooner or later, and is accompanied by great disturbance of the electrical currents. If it occur early, no observations of any value can be made. Hemorrhage, the development of currents in the electrodes, and other causes, render a large number of the experiments unproductive. The investigation thus far tends to indicate that the electrical currents of the gray matter have a relation to its function similar to that known to exist in peripheral nerves, and that the study of these currents may prove a means of throwing further light on the functions of the hemispheres.

Considering the comparatively small number of experiments yet made, and also the obscurity which involves the whole subject of the electrical currents of nerves, great caution is needful in drawing inferences from the facts above stated, and any such inferences must be considered merely provisional until many more observations have been made.

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THE DEPRESSOR AND ACCELERATOR CENTRES IN THE CORD.—W. Weliki and W. Istranin. Preliminary communication in the *St. Petersburger Med. Wochenschr.*

Vulpian has shown that irritation of the cord by the electrical current at the level of the second cervical vertebra, has dilatation of the vessels of the retina and the intestines for a result, and produces contraction of the spleen. The experiment was performed on a curarized dog. This phenomena is similar to that we observe after irritation of the central end of the depressor nerve. We have repeated this experiment with the modification that the pressure in the carotid artery was registered by means of the kymographion. After curarization of the animal experimented upon, and opening the spinal cavity at the second cervical, the cord was irri

tated by a weak induction current (scarcely perceptible to the tongue) at about this level, the result was increased pressure in the carotid and slowing of the pulse-beat. With irritation at the level of the epistropheus, we observed sometimes an increase and sometimes a diminution of the pressure, but the variations were extremely slight. By carrying the irritation more peripherally, as far as to the point from which the nerve fibres forming the third pair are gathered together, we had a decided lowering of the pressure and a marked acceleration of the heart-beats. These facts should find their explanation in the supposition that with the irritation of the depressor centres diffusion currents also excite the accelerator centres, which probably lie in their immediate neighborhood.

The following are the most striking curves of variation of the blood pressure. Using *a*, to denote the spot over the second cervical, *b'*, that at the level of the first fibres of the third pair of nerves, *b''* the one two millimetres lower down, and *b'''*, that still one millimetre lower, we have

Duration of Experiment.	Locality Irritated.	Pressure before Irritation.	Pressure during Irritation.	Pulse for 10" before Irritation.	Pulse for 10" during Irritation.	Absolute Variation of Pressure.
10'	<i>b'</i>	118	112	8	9	— 6
—	<i>b''</i>	124	100	8	11	— 24
—	<i>b'''</i>	122	76	9	15	— 46
—	<i>a'</i>	108	150	9	7	+ 42

We have often noticed acceleration of the heart-stroke before the occurrence of any noticeable decrease of pressure—these facts suggest that the accelerator centre may be situated somewhat higher than the depressor; that is a conjecture. The electrodes must be inserted deeply into the substance of the cord, as far as to the anterior columns. The acceleration after the irritation lasts fifteen seconds, while the pressure variation immediately disappears.

After this communication had already gone to press, we received the last number of Brown-Sequard's Archives, containing a memoir by Claude Bernard on the accelerator centre in the cord.

Claude Bernard has demonstrated this centre in an entirely different way from ours—still, this circumstance renders our results more worthy of credence—as regards our results in relation to the depressor centre, they belong to us alone.

The following are the titles of some recent articles on the Anatomy and Physiology of the Nervous System:

LUSSANA and LEMOIGNE, On the cerebral motor centres, *Lo Sperimentale*, April and May, 1877; VANCE, The Encephalic circulation, *N. Y. Med. Record*, May, 12; BIFFI, Organism and Mentality, *Archivio Italiano*, Jan. 1877; LANGLET, Cerebral Localizations, *Rev. Med. du Nord-Est*, March, 31.